

## Health Care Enterprise Integration Tools Using a WWW Platform: Application in an Infectious Disease Service

Steven E. Labkoff, MD<sup>1</sup>, Johanna P. Daily, MD<sup>2</sup>, Tom Karson, MD<sup>1</sup>, Jonathan Schaffer<sup>1</sup>, MD, Luke Sato, MD<sup>1</sup>, Greg McHolm, MD<sup>1</sup>, Jihad Obeid, MD<sup>1</sup>, Patrick Shareck, MD<sup>1</sup>, and Robert A. Greenes, MD, PhD<sup>1</sup>

<sup>1</sup>Decision Systems Group, Brigham and Women's Hospital, Harvard Medical School, Boston, MA

<sup>2</sup>Division of Infectious Diseases, Brigham and Women's Hospital, Harvard Medical School, Boston, MA

As health care institutional relationships and alliances become more complex, in regional health care networks and other organizations, communication among patients, primary providers, specialists, health care facilities, and other services, information technology must play a major role in facilitating patient care, decision support, education, and management functions. Getting information to disparate groups of individuals around a large enterprise with many off-campus centers, clinics, and offices presents special challenges.

A major area of activity in the Decision Systems Group is the development of approaches to information delivery in the health care enterprise. Within the extended enterprise, various groups will all have access to the BICS clinical information system, developed by the Brigham and Women's Hospital Information Systems Department. The Decision Systems Group, in conjunction with Partner's Health Care, Inc., is implementing a complementary enterprise-wide information network based on the World Wide Web. We have created a new information dissemination resource which is both enterprise-wide and platform-independent. The telecommunications plan being developed for the extended enterprise will accommodate both BICS and WWW access. Initially, for security reasons, clinical data will not be available via the WWW although interfaces between BICS and the WWW-based environment are being explored.

The WWW-based platform provides information aimed initially at supporting primary care, through access to guideline libraries, other decision aids, guideline libraries, education materials, information about the various institutions, services, and departments within the Partners network, events, news, location and transportation directions, and a physician referral directory service. We have developed a distributed architecture for this system in which each resource is considered to be a component, with well defined interface to other components. Responsibility for content development, maintenance, and update is distributed in this approach, and carried out by knowledgeable experts in the relevant areas.

Many of the components provide interfaces to relational databases, and others provide various analytic or presentation capabilities. An entity-relationship

model of the interactions among the various information users and providers was initially created.

By using client server techniques, we have created components that deliver their information in HTML format, and accept user input from HTML forms, but which interact with database servers and other tools.

We have used this framework to meet a recurring need of the Infectious Disease Division, i.e., responding to frequently asked questions from referring physicians and patients, to alleviate the high volume of telephone inquiries received. The approach is to provide advice in the form of interactive medical guidelines, indexed by problem. Currently these guidelines deal with tuberculosis prophylaxis and animal bite care, including rabies treatment and prophylaxis. By use of CGI scripts and interactive exchange of data, these guidelines provide advice reflecting characteristics of specific groups of patients.

Guideline logic is stored in a decision table. By comparing the query to the table, an answer or a request for more information is generated. The response to the query produces a pointer to a recommendation or a request for additional information. This information is then presented to the user via a response generated by a CGI script.<sup>1</sup>

The guidelines are presented in one of two forms: 1) an interactive flow chart which is traversed by answering a series of questions to navigate the guideline logic and, 2) as a series of forms which collect several answers at a time allowing for more rapid access to recommendations. The former method is helpful in teaching the logic to students and house officers, the latter being more helpful for physician assistants and nurse practitioners. Despite the differences in presentation, the functionality is the same with respect to providing information.

1. Liem EB, Obeid JS, Shareck P, Sato L, Greenes RA. Representation of clinical practice guidelines through an interactive World-Wide-Web interface. Proceedings for the 19th Annual Symposium for Computer Applications in Medical Care 1995, 223-227.